REMARKS/ARGUMENTS

A. Summary of the Amendment

By way of the present amendment, claim 1 is amended. No claims are added, although claim 7, 16, and 36 to 71 were previously canceled. Thus, claims 1 to 6, 8 to 15, and 17 to 35 remain pending for the Examiner's consideration, with claims 1, 10, 17, and 22 being independent claims.

B. Allowable Subject Matter

The examiner has acknowledged that claims 14 and 27 are directed to allowable subject matter. Applicants thank the Examiner for a through examination of these claims.

C. Rejections Under 35 U.S.C. § 102(e)

Claims 1, 3 to 4, 6, 8 to 9, and 21 to 22 are rejected as being anticipated by U.S. Patent No. 6,759,151 (Lee '151). These rejections are respectfully traversed.

Regarding independent claim 1, the current amendment removes some features from the claim, and adds the feature that a protective barrier coating includes a metal disilicate-containing oxidation barrier coating formed between between a substrate and an environmental barrier coating that includes tantalum oxide or an alloy thereof. Reviewing FIG. 1 of the present application, the protective barrier coating includes has the following structure:

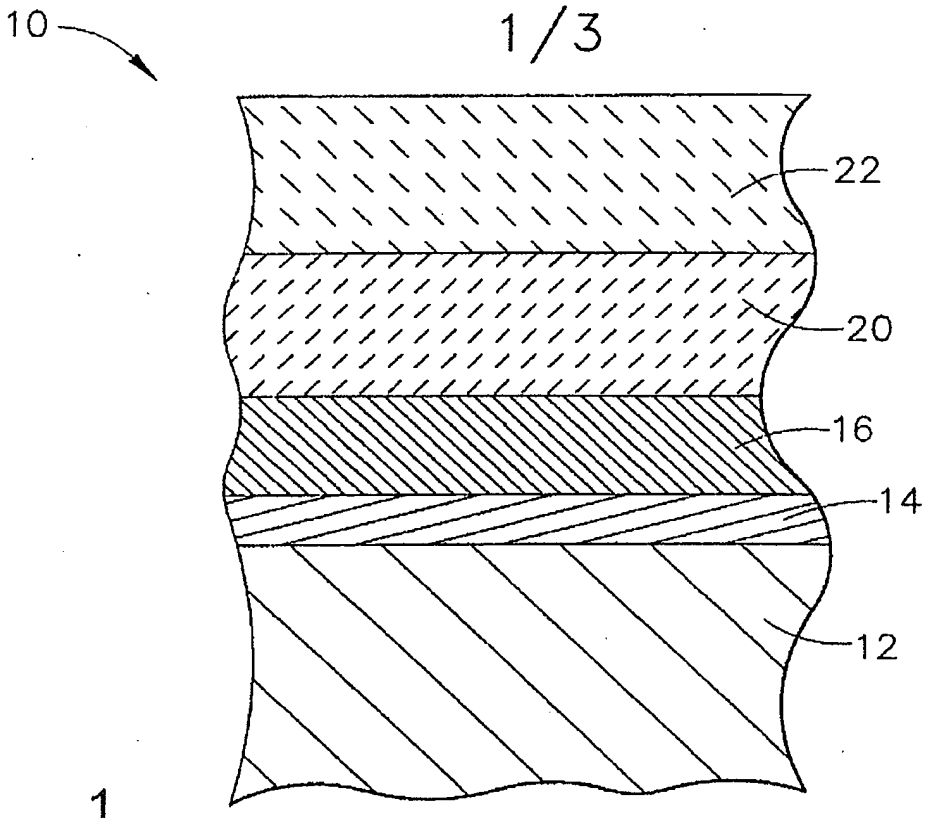

FIG. 1

As recited in claim 1, the protective barrier coating includes a metal disilicate-containing oxidation barrier coating (16). Formed over the oxidation barrier (16) is an environmental barrier coating (20) that includes tantalum oxide or an alloy thereof.

The Examiner asserts that Lee '151 discloses a coating structure in which a metal disilicate (BSAS) is coated on a substrate, and a coating that includes tantalum oxide alloy ($HfTaO_4$) is formed over the BSAS. However, it is pointed out that BSAS is a compound that includes a silicate (SiO_2) molecule, not a disilicate (Si_2O_7). Furthermore, nowhere in Lee '151 is there any teaching or suggestion that a metal disilicate is included in any intermediate layers. In fact, Lee '151 does not mention any metal disilicates throughout the specification. Thus, it is clear that Lee '151 fails to teach or suggest a coating structure in which a metal

disilicate-containing oxidation barrier coating is formed beneath an environmental barrier coating that includes tantalum oxide or an alloy thereof. For at least this reason, the rejection of claim 1, 3 to 4, 6, and 8 to 9 should be withdrawn.

The rejection of claim 21 is improper, as claim 21 depends from independent claim 17, which is not rejected as being anticipated by Lee '151. Furthermore, the pertinence of Lee '151 to independent claim 17 will be discussed subsequently.

Regarding independent claim 22, the claim recites that an oxidation barrier coating of scandium disilicate is formed on the diffusion barrier coating and that an environmental barrier coating is formed on the oxidation barrier coating and comprises one of a tantalum oxide alloy and a mixture of scandium disilicate, scandium monosilicate and scandium oxide. Referring again to FIG. 1 of the present application (shown above), claim 22 recites that oxidation barrier coating (16) includes scandium disilicate. Lee does not mention scandium disilicate as a component of any coating layer, and in fact fails to ever mention scandium disilicate in any context. Lee mentions that scandium silicate ($ScSiO_5$) may be included in a chemical barrier layer (18) and/or an overlying outer layer (12). However, this falls short of teaching or suggesting the scandium disilicate-including oxygen barrier coating (16) recited in claim 1 of the present application. For at least this reason, the rejection of claim 22 should be withdrawn.

D. Rejections Under 35 U.S.C. § 103(a)

Claims 1 to 6, 8 to 13, 15, 17 to 26, and 28 to 35 are rejected as being unpatentable over U.S. Patent No. 6,733,908 (Lee '908) in view of Lee '151. These rejections are respectfully traversed.

Independent claim 1 recites a protective barrier coating that includes a metal disilicate-containing oxidation barrier coating (16). Formed over the oxidation barrier (16) is an environmental barrier coating (20) that includes tantalum oxide or an alloy thereof. In contrast, Lee '151 (discussed previously) is the only reference of those cited that discloses

tantalum oxide as a member of any coating layer. Lee '151 discloses a coating structure in which a metal disilicate (BSAS) is coated on a substrate, and a coating that includes tantalum oxide alloy ($HfTaO_4$) is formed over the BSAS. However, it is again pointed out that BSAS is a compound that includes a silicate (SiO_2) molecule, not a disilicate (Si_2O_7). Furthermore, nowhere in Lee '151 is there any teaching or suggestion that a metal disilicate is included in any intermediate layers. Lee '908 is the only cited reference that mentions disilicate compounds, and indeed references rare earth disilicates ($RE_2Si_2O_7$). However, Lee '908 only teaches that disilicates may be used in an outer chemical barrier layer 22, together with or in addition to the tantalum oxide alloy outer layer disclosed in Lee '151 (see Lee '908, col. 7, lines 37 to 50). Thus, nowhere in either reference, alone or in combination, is there a teaching or suggestion that a metal disilicate is used anywhere other than an outer layer (layer 12 in Lee '151 or layer 22 in Lee '908). The combination clearly fails to teach or suggest that a metal disilicate-containing layer is covered with another layer that includes tantalum oxide. For at least this reason, the rejection of claims 1 to 6, and 8 to 9 should be withdrawn.

Each of independent claims 10, 17, and 22 recites, like claim 1, that a metal disilicate is included in an oxidation barrier coating, and that the oxidation barrier coating is covered with an environmental barrier coating that includes:

either a tantalum oxide alloy or a scandium silicate mixture (claim 10),

either a tantalum oxide alloy or scandium disilicate (claim 17), or

either a tantalum oxide alloy or a mixture of scandium disilicate, scandium monosilicate and scandium oxide (claim 22).

As previously discussed, the Lee '151 and Lee '908 combination discloses a rare earth disilicate, but only as an outer layer (layer 12 in Lee '151 or layer 22 in Lee '908), and never as a layer that is covered with any of the compositions set forth in claims 10, 17, or 22. For at least this reason, the rejections of claims 10 to 13, 15, 17 to 26, and 28 to 35 should be withdrawn.

Furthermore, regarding independent claims 10 and 22, each of these claims recites, *inter alia*:

a) an environmental barrier coating comprising either a tantalum oxide alloy or a scandium silicate mixture; and

b) a thermal barrier coating formed on the environmental coating, and comprising stabilized zirconia.

Neither of the Lee references teaches or suggests a stabilized zirconia layer formed over a layer containing any of the materials defined as part of the environmental barrier layer recited in claims 10 and 22. At best, Lee '908 discloses a stabilized zirconia outer layer. Lee '151 also discloses a stabilized zirconia outer layer but only as an alternative to a tantalum oxide alloy outer layer, but does not disclose the two as separate, overlying layers. Neither of these references, alone or in combination, teaches or suggests the various layers as presently claimed. Consequently, the rejection of claims 10 and 22, and those claims depending therefrom, should be withdrawn.

Further regarding independent claim 17, the rejection is further traversed since Lee '908 fails to compensate for the above-discussed deficiencies of Lee '151. Nowhere does either of the Lee references disclose the diffusion barrier coating defined in claim 17 formed on a silicon-carbide-based substrate or a silicon nitride-based substrate. Lee '908 discloses a substrate (12) that includes silicon metal alloys or silicon ceramics. Lee '908 also discloses a bond coat (18) formed directly on the substrate, but fails to teach or suggest that the bond coat includes 99 to 100% pure Si_3N_4, SiC or Si_2ON_2 as recited in present claim 17. None of the other layers in the multilayer article disclosed in Lee '908 include any type of silicon-based material whatsoever. Without providing any disclosure of a diffusion barrier coating formed over a silicon-based substrate, Lee '908 clearly fails to compensate for the deficient teachings of Lee '151. For this additional reason, the rejection of claim 17 and those claims depending therefrom should be withdrawn.

Also, claim 17 recites, *inter alia*:

a) a silicon carbide or silicon nitride substrate, and

b) a diffusion barrier coating in the range of 99 to 100% pure Si_3N_4, SiC or Si_2ON_2 on said substrate.

Turning briefly to the present specification at paragraphs 0026 to 0027, the benefits of this diffusion barrier coating is explained. Cations (i.e. from lanthanum or yttrium compounds) that are commonly produced as a result of sintering aids used to create ceramic substrates are likely to diffuse out of the substrate and into a protective coating formed thereon. The diffusion barrier coating of the present invention, i.e. having substantially pure silicon ceramics or oxynitrides, allows the use of such sintering aids without degrading overlying oxidation barrier coatings or environmental barrier coatings.

Nowhere does Lee '151 disclose such a diffusion barrier coating formed on a silicon-carbide-based substrate or a silicon nitride-based substrate. Lee '151 discloses a substrate (10) that includes silicon metal alloys or silicon ceramics such as silicon carbide and silicon nitride (col. 5, lines 20 to 37). Lee also discloses a bond coat (16) formed directly on the substrate, but fails to teach or suggest that the bond coat includes 99 to 100% pure Si_3N_4, SiC or Si_2ON_2 as recited in present claim 17. None of the other layers in the multilayer article disclosed in Lee '151 include any type of silicon-based material whatsoever. Without providing any disclosure of a diffusion barrier coating formed over a silicon-based substrate, Lee '151 clearly fails to anticipate the claims. For this additional reason, the rejection of claim 17 and those claims depending therefrom should be withdrawn.

E. Conclusion

In view of Applicant's amendments and remarks, it is respectfully submitted that Examiner's objections and rejections have been overcome. Accordingly, Applicants respectfully submit that the application is now in condition for allowance, and such allowance

is therefore earnestly requested. Should the Examiner have any questions or wish to further discuss this application, Applicants request that the Examiner contact the Applicants attorneys at the below-listed telephone number. If for some reason Applicants have not requested a sufficient extension and/or have not paid a sufficient fee for this response and/or for the extension necessary to prevent abandonment on this application, please consider this as a request for an extension for the required time period and/or authorization to charge Deposit Account No. 50-2091 for any fee which may be due.

Respectfully submitted,

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